The Maintenance and Operations Decision Support System (MODSS):

Advancing Road Weather Decision Support

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Historical Perspective

Federal Highway Administration’s Road Weather Management Program:

- Develop an understanding of how weather and road conditions impact the nation’s roadways
- Determine how best to mitigate road weather impacts

In 2001, FHWA initiated a program to develop a winter road Maintenance Decision Support System (MDSS).

- Construct a functional prototype MDSS that could provide objective guidance to winter road maintenance decision makers concerning the appropriate treatment strategies to use to control roadway snow and ice during adverse winter weather events
- Provide a system that would serve as a catalyst for additional research and development by the private sector
Historical Perspective

The MDSS:

- Real-time observations
- Weather forecasts
- Road condition forecasts
- Recommended treatments

To date, four versions of the MDSS prototype code have been made freely available to the surface transportation stakeholder community, with the last release (MDSS Release-4) occurring in the spring of 2006. MDSS Release-5 is slated for Fall 2007.
System Output

Plow route specific information

Weather parameters
  Air temperature
  Relative humidity
  Wind speed and direction
  Precipitation type, rate, accumulation

Road Parameters
  Road temperature
  Bridge temperature
  Bridge frost potential
  Blowing snow potential
  Road contamination & chemical concentration

Treatment recommendations
  Treatment type (plow, chemical, pre-treat, etc.)
  Treatment amount
  Treatment location
Advancing Road Weather Decision Support

The MDSS project has shed light on the need for decision support tools for other categories of roadway transportation decision-makers such as:

- Traffic management personnel
- Emergency management personnel
- Construction supervisors and crews
- Maintenance practitioners (beyond snow and ice control)

Broad needs and requirements met by current and new road weather decision support systems:

- Centralized weather support
- Enhanced strategic planning capacity
- Improved tactical response capability
- Improved adverse road weather notification
- Operation-specific decision support guidance
Advancing Road Weather Decision Support

The Maintenance and Operations Decision Support System (MODSS)

MODSS

Data Server/Processor
- Weather Observation Data
- Weather Prediction Data
- Hydrological Observation Data
- Hydrological Prediction Data
- Pavement Condition Data
- Pavement Condition Model
- Transportation System Data

Transportation System Data

Weather Prediction & Observations Data

Winter Maintenance DSS

Traffic Management DSS

Roadway Maintenance DSS

Emergency Management DSS

Construction DSS

TBD DSS
Basic MODSS Characteristics

- Rapid updates should be provided (minutes not hours)
- Extreme quality control should be employed
- Historical data should be available (event review)
- Data export should support common formats (xml, shape files, etc.)
- Automated alerts should be provided (user defined thresholds)
- Design should support tactical (0-3 hrs) and planning horizons (1 to 5 days)
- An event planner feature should be provided
Advancing Road Weather Decision Support

The Maintenance and Operations Decision Support System (MODSS)
Preliminary User Needs Assessment Report

- Surface Transportation Weather Decision Support Requirements (STWDSR) (Mitretek)
- Integration of Emergency & Weather elements into Transportation Management Centers (Battelle)
- Weather Responsive Traffic Management (Cambridge Systematics)
- Best Practices for Road Weather Management (Mitretek)
- Weather Information for Surface Transportation (NOAA)
- Where the Weather Meets the Road (National Academies)
- WeatherShare (Western Transportation Institute)
- Missouri Weather Response System (Mixon/Hill)

Stakeholder meetings in late February and early March 2007 to validate and refine the weather and road condition information needs

Concept of Operations (ConOps) currently under development
Roadway Maintenance Decision Support System

Road weather based guidance in support of:

• Surface Repair
  Preventative/Routine Maintenance
  Crack Sealing
  Fog Seals
  Chip Seals
  Microsurfacing
  Thin Lift Overlays
  Reactive Maintenance
  Pothole Patching
  Pavement Blowups

• Lane Striping

• Mowing

• Weed Spraying
Roadway Maintenance Decision Support System Framework

Data Acquisition and Processing (DAP) Module
- NWS Forecast Products
- Road Weather Observations
- Road Weather Forecast Data
- Road Maintenance Operations Data

Roadway Ops ADvisement (ROAD) module
- Road Weather Observations
- Road Weather Forecasts
- Rules of Practice
- Previous Road Ops Actions

Data Display and Delivery (D3) module
- Road Weather Data
- Recommended Actions
- WX and Road Condition Alerts
- Activity Planner
- End User Action Input
Traffic Management Decision Support System

Road weather based guidance in support of:

• Traveler Information
• Control Strategies
  • Signal Timing
  • Ramp Metering
  • Road Closures
  • Traffic Routing
  • Etc.
• Incident Management
Traffic Management Decision Support System Framework

Data Acquisition and Processing (DAP) Module
- NWS Forecast Products
- Road Weather Observations
- Road Weather Forecast Data
- Traffic Management Data

Roadway Ops ADvisement (ROAD) module
- Road Weather Observations
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- Previous Traffic Management Actions

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